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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/848,773	05/03/2001	Qian Chen	06666/076001/USC-2892	6630

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EXAMINER	
NGUYEN, KIMBINH T	
ART UNIT	**PAPER NUMBER**
2671	

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/848,773	CHEN ET AL.	
	Examiner	Art Unit	
	Kimbinh T. Nguyen	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24,29-39 and 43-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24,29-39 and 43-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to amendment filed 12/09/04.

2. Claims 1-24, 29-39, 43-63 are pending in the application.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-13, and 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayache et al. (6,175,648) in view of Kang (6,061,468).

Claim 1, Ayache et al. discloses obtaining two images of similar image information (similarity index) from two uncalibrated sources (the images are delivered by n respective detectors seeing the scene from different points of view; abstract); superimposing lines to rectify the two images (the epipolar lines are parallel and coincident with the image line columns; col. 5, lines 7-9); using the rectified images to form 3D (col. 2, lines 25-37) by forming a disparity map of 3D (col. 4, line 9 through col. 7, line 29). Ayache teaches the images are delivered by a respective detectors seeing the scene from different points of view (abstract) and does not show clearly uncalibrated cameras; however, Kang teaches 2D images taken by a camera undergoing some arbitrary motion (uncalibrated cameras; se abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the

images taken by an uncalibrated camera as taught by Kang into the Ayache's method, because it would provide a method for obtaining either a full or quasi-Euclidean reconstruction of an object from a specific sequence of images taken by an calibrated camera (col. 2, lines 37-40).

Claims 2-4, 9-13, Ayache et al. teaches disparity map indicating an estimate of 3D surface and information of the estimate (col. 2, lines 40-44; col. 4, lines 12-17); manually establishing matching parts (col. 4, lines 32-34, lines 47-49); identifying parts in the image (col. 8, lines 40-44), using automatically rectified images to form 3D information (col. 5, lines 3-14); forming a disparity surface indicative of 3D information of the image (col. 8, lines 65-67); a difference between coordinates of matching pixels (col. 9, lines 8-10); a variable denoting a degree of similarity between pixels (col. 8, lines 55-58), a variable of error in 3D surface (a degree of disparity which is inconsistent with the disparities on all the other curves; col. 9, lines 6-7).

Claims 5-7, Ayache et al. discloses defining images in terms of epipolar geometry (epipolar lines; col. 5, lines 7-9), aligning the images in the epipolar geometry (epipolar lines are parallel and coincident with the image lines or column; col. 5, lines 6-9); aligning specified reference lines which include lines passing through manually-obtained image parts (fig. 6).

Claim 8, Ayache et al. discloses finding an average of end points of two different reference lines, forming a line through an averaged part (the Euclidian distance in a plane between points in a pair of images 1 and 2; fig. 6).

Claims 43 -45, Ayache teaches an image from two uncalibrated cameras to obtain 3D information (producing cartographic data in 3D from n two-dimensional images of the scene; col. 2, lines 35-38); rectifying the image to form coplanar images with scan lines are horizontally parallel (col. 5, lines 4-14); identifying points, scan lines which pass through the points forming horizontally parallel scan lines (epipolar lines; col. 5, line 1 through col. 6, line 15); disparity map (col. 7, lines18-30). Ayache teaches the images are delivered by a respective detectors seeing the scene from different points of view (abstract) and does not show clearly uncalibrated cameras; however, Kang teaches 2D images taken by a camera undergoing some arbitrary motion (uncalibrated cameras; se abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the images taken by an uncalibrated camera as taught by Kang into the Ayache's method, because it would provide a method for obtaining either a full or quasi-Euclidean reconstruction of an object from a specific sequence of images taken by an calibrated camera (col. 2, lines 37-40).

5. Claims 29, 31-34, 39, 46-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodfill et al. (6,456,737) in view of Ayache et al. (6,175,648) and Greenspan (6,026,189).

Claims 29, 31, 32, 33, 34, Woodfill et al. discloses obtaining first and second images of the same object (col. 12, line 15 through col. 13, line 10); identifying objects in the first and second images (object 11 and background 12 of fig. 1) aligning the lines in an epipolar geometry (epipolar lines; col. 16, lines 27-29); Woodfill does not teach using the first and second images with the

aligned lines to form 3D information; however, Ayache et al. teaches epipolar lines are parallel and coincident with the images lines or columns; col. 5, lines 8-9); using the first and second images with the aligned lines (the rectified images 1 and 2) to form 3D information (3D reconstruction is performed; col. 1, lines 29-33); It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the 3D reconstruction from rectified images taught by Ayache into the data processing of Woodfill, because it would produce data which is improved in particular in that it makes easier to establish multi-pair correspondence of images (col. 2, lines 5-8). Woodfil does not teach identifying seed voxel; however, Greenspan teaches identifying seed voxel (root node sets contain the original voxel; col. 8, lines 60-65; col. 10, lines 36-39) for different parts of 3D surface with a high probability of being correct 3D which is greater than a specified threshold (greater than 0.99, greater than predetermined threshold); and determining which of two voxel to use at the intersection col. 7, lines 24-25; col. 10, lines 36-63). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the seed voxel taught by Greenspan into the Woodfill system, because it would provide a method of recognizing objects within image (col. 2, lines 60-61).

Claim 39, the rationale provided in the rejections of claims 9 and 29 are incorporated herein.

Claims 46-63, the rationale provided in the rejection of claims 1, 3, 5-8, 29, 43, 44 above are incorporated herein.

6. Claims 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayache et al. (6,175,648) in view of Kang (6,061,468), and further in view of Sawhney et al. (6,571,024).

Claims 19-23, Ayache does not teach Euclidean points; however, Sawhney et al. teaches converting the volume to Euclidean points (col. 5, lines 53-55); projecting a reconstruction of the volume, reconstructing Euclidean points from the projective reconstruction (col. 6, lines 25-36); transforming an origin of coordinate system to an origin of the images (image transformation; fig. 18, # 804); input a parameter (focal length; adjust the parameter (refining parameter; fig. 18, # 806) to approximate a proper Euclidean reconstruction (col. 5, lines 37-61). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the Euclidean reconstructing as taught by Sawhney into the method for rectifying images of Ayache for forming 3D image from 2D similar images, because it would provide a method of camera pose and scene geometric information for each frame of a video sequence (col. 2, lines 2-3).

7. Claims 14-16, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayache et al. (6,175,648) in view of Kang (6,061,468), and further in view of VanEssen et al. (6,591,004).

Claims 14, 15, Ayache does not teach tracing voxels; however, VanEssen et al. teaches tracing voxels in a multiresolution at coarsest level and a more detailed level (col. 25, lines 42-45; col. 26, lines 55-67); selecting the seed voxel using a winner take which has a maximum correlation value; identifying seed

voxels which represent incorrect matches, removing the seeds after tracing (col. 19, lines 53-67). **Claim 16, 24**, Ayache does not teach a seed voxel; however, VanEssen et al. teaches selecting a seed voxel by finding uniqueness (col. 44, line 65 through col. 45, line 23); dividing the surface into parts (segmented), the seed voxels are respectively for parts (col. 22, lines 28-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the tracing voxels and selecting voxels as taught by VanEssen into the method for rectifying images of Ayache for forming 3D image from 2D similar images, because it would provide a method for reconstructing surfaces and analyzing surface volume representations of the shape of an object corresponding to image data, in which the object has been modeled as one or more physically distinct compartments (col. 2, lines 53-57).

8. Claims 30, 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodfill et al. (6,456,737) in view of Ayache et al. (6,175,648) and further in view of VanEssen et al. (6,591,004).

Claim 30, 35-38, Woodfil does not teach seed voxel; however, VanEssen et al. teaches forming the surface map by propagating from the seed voxel; determining intersection between two voxels at different parts; determining probability of two voxels finding neighbors for voxels one by one); (col. 25, lines 49-55), and selecting the higher probability as the voxel to use selecting a seed voxel that the best matches the corresponding pixel information and has a probability of being correct which is greater than a specified threshold (col. 26, line 64 through col. 27, line 5); identifying voxels represent incorrect matches and

removing incorrect matching voxels (col. 23, lines 27-40). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the tracing voxels and selecting voxels as taught by VanEssen into the method for rectifying images of Woodfill for forming 3D image from 2D similar images, because it would provide a method for reconstructing surfaces and analyzing surface volume representations of the shape of an object corresponding to image data, in which the object has been modeled as one or more physically distinct compartments (col. 2, lines 53-57).

9. Claims 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayache et al. (6,175,648) in view of Kang (6,061,468), and further in view of VanEssen et al. (6,591,004) and Szeliski et al. (5,917,937).

Claims 17 and 18, Ayache does not teach using a winner take which has a maximum correlation value; however, Szeliski et al. teaches winning cell (col. 9, lines 40-45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the seed voxel and winning cell as taught by Szeliski into the rectifying images of Ayache's method for forming 3D images, because it would provide a stereo matching method simultaneously recovers disparities from input images to reconstruct 3D surface (abstract).

Response to Arguments

10. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone

number is (571) 272-7644. The examiner can normally be reached **(Monday-Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (571) 272-7653.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-

direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

April 12, 2005

KIMBINH T. NGUYEN
PRIMARY EXAMINER